

EMOTIONAL MACHINE ORCHESTRATOR

By Point of View

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THE SMALL PROBLEM

- Many text generation platforms are apathetic or unpredictably emotional. It would be useful to be able to generate specific emotional text.
- This could be useful for chatbots presenting a specific emotion or for realistic emotional dialogue creation.

THE BIG PROBLEM

- A major goal of AI Practitioners is to create a system that can generate creative fiction.
- A subset of this work would be the creation of a dialogue system that builds on specific character archetypes and situations.
- Emotional modeling could be used in conjunction with personality modeling, dialect modeling, etc. to build distinctive characters and to create a story trajectory that is meaningful.

OUR SOLUTION

- We built a package of six different emotional text generation models, collectively referred to as EMO: Emotional Machine Operator.
- Each model is associated with a specific emotion



USING THE MODEL

Option 1: An emotion is designated



A “Call” is entered as an input



Multiple options for “Responses” are displayed

Option 2: An arc of emotions is designated



A “Call” is entered as an input

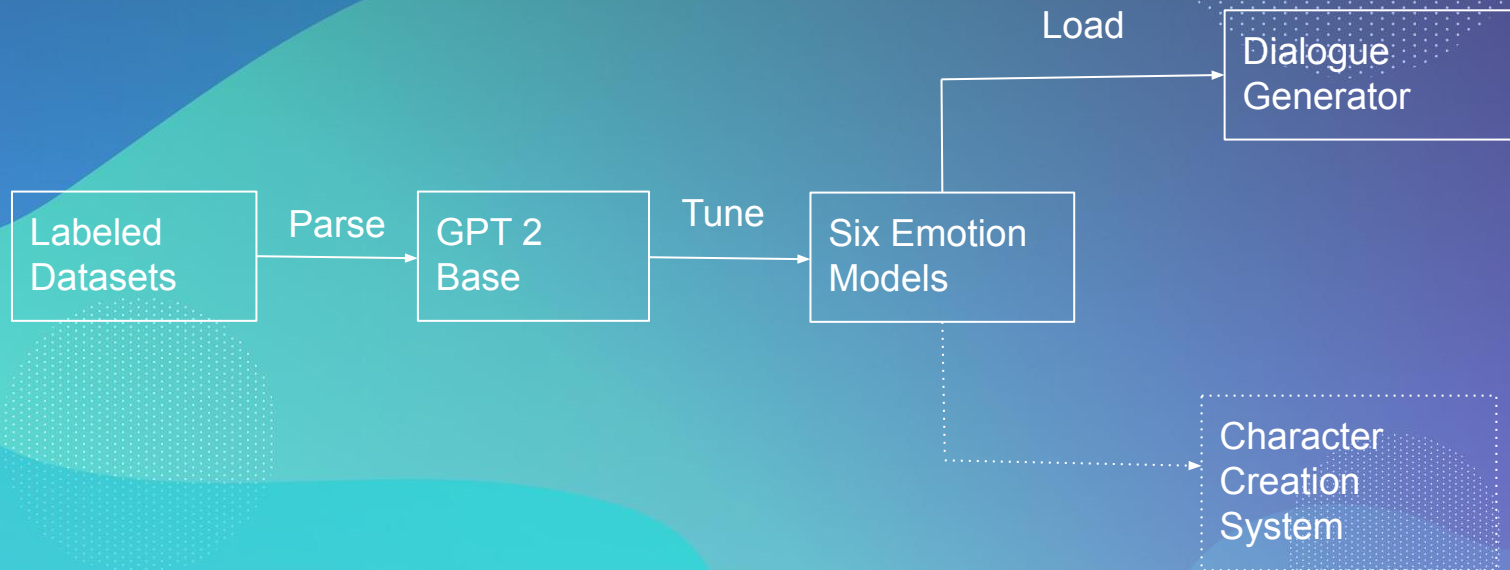


A single set of dialogue following the emotional arc is displayed



DEMO: Tackling the Small Problem

PIPELINE



DIVING DEEP

- Preliminary research to determine which emotions to include
- Models are built on GPT-2, a tunable open source language model from OpenAI
- Combined two datasets to finetune our models
- Optimized our tuning using quantitative data results.
- Developed a Python script that accepted a set of emotions and loaded our EMO models to create a dialogue.

CHALLENGES

- Navigating GPT-2
- Time constraints of fine-tuning GPT-2
- Sourcing sufficiently large, detailed datasets (right)
- Optimizing GPT-2-simple's fine tuning parameters
- Increasing context-guided content of responses

DailyDialog: A Manually Labelled Multi-turn Dialogue Dataset

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Abstract

We develop a high-quality multi-turn dialogue dataset, **DailyDialog**, which is intriguing in several aspects. The language is human-written and less noisy. The dialogues in the dataset reflect our daily communication way and cover various topics about our

A: I'm ~~worried~~ about something.
B: What's that?
A: Well, I have to drive to school for a meeting this morning, and I'm going to end up getting stuck in rush-hour traffic.
B: That's ~~amazing~~, but nothing to worry about. Just breathe deeply when you feel yourself getting upset.

1. Introduction

Developing a chatbot that can engage in meaningful conversations is not just a technical challenge, but also a social one. In this paper, we introduce a new dataset, **DailyDialog**, which is designed to be a high-quality multi-turn dialogue dataset. The dataset is collected from various TV scripts and private Facebook messenger dialogues. This set of more than 10,000 dialogues are labeled in **EmotionLines**. We also provide several strong baselines for emotion detection models in **EmotionLines** as the open

EmotionLines: An Emotion Corpus of Multi-Party Conversations

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Abstract

Feeling emotion is a critical characteristic to distinguish people from machines. Among all the multi-modal resources for emotion detection, textual datasets are those containing the least detailed information in addition to semantics, and hence are subject to noisy labels. However, emotion detection is a challenging task in natural language processing, and hence is often used as a benchmark in many NLP tasks. In this paper, we introduce **EmotionLines**, the first dataset with extensive labeling of all dialogues in each utterance, not only on the level of the utterance, but also on the level of the word. **EmotionLines** are collected from various TV scripts and private Facebook messenger dialogues. This set of more than 10,000 dialogues are labeled in **EmotionLines**. We also provide several strong baselines for emotion detection models in **EmotionLines** as the open

Keywords: emotion detection, emotion corpus, emotion detection models

1. Introduction

There are two major kinds of dialogue systems: a task-oriented dialogue system and the social (chat) dialogue system. The former focuses on designing a personal assistant which can accomplish certain tasks, and for the latter it is important to capture the conversational flow which replicates more on the feelings of the speaker. Many researchers try to build a "smart" dialogue system by enhancing dialogue branch (conversational, dialogue depth complexity) or both. Those who want to increase dialogue breadth try to transfer dialogue with various domains (Chen et al., 2015) to enable multi-domain or even open domains dialogue systems, and those who want to deepen dialogue complexity pay their attention to transferring a knowledge-based system to common sense or even commonsense systems that can integrate domain theories, generate creative novel responses (Peng et al., 2016), or learn how to play the dialogue system in a high-level abstraction (Beltz et al., 2016). No matter what kind of dialogue system we want to build, a useful and large dialogue dataset is indispensable.

When building a task-oriented dialogue system, dialogue corpora with dialogue are information is accessible and hence are commonly utilized. However when building a chat-style conversational bot, though the importance of emotion detection has been noticed, prior conversational datasets such as movie, TV script or chat logs without emotion labels are more available, or sometimes labels are missing can be used for learning. Moreover, when we turn to other datasets with annotated emotion information such as data crawled from Twitter (Ostendorf and Breyer; Mageroth, 2017), the labeled data (posts or utterances) are independent. As a result, models built with these datasets lack the ability to consider contextual information external

to dialogue systems, not to mention the ability to capture the emotion flow. We illustrate this issue with examples shown in Table 1.

Post	Label
Just got back from seeing @GaryDelany in Brooklyn. AMAZING! Post still turns from laughing to much laughter.	Joy
Feeling emotions in always deepens my	Sadness
I got no nervous even thinking about talking to *** I want to do	Fear
Was not using @motherfucker	Anger
@Motherfucker again? These guys cant get nothing right! #drinking	Fear

Table 1: Emotion labeled posts without contextual information collected from WASSA-2017 Shared Task on Emotion Intensity

Modeling emotion on one single utterance without contextual information may encounter another issue that the same utterance can express different emotions depending on its context. Table 2 shows some examples of saying "Oh!" with different emotions. The EMOCAP database (Brezzi et al., 2008), is the best of our knowledge, is the only dataset that provides emotion labels for each utterance. However, EMOCAP was created by using performance emotion, and hence carries the risk of overfitting. Moreover, the annotators label the emotion by matching the video instead of reading the transcripts which means the annotators may make the decision only depend on the facial expression or the prosodic features without realizing the meaning of the words.

To tackle these problems, we create **EmotionLines** as

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FUTURE WORK

- Fine tuning GPT-2 on larger data sets and/or using automated sentiment analysis to generate larger, more diverse training files
- Evaluating accuracy of generations with automated sentiment analysis
- Increasing tolerance of multi-line input
- Using fine tuned models to create a framework for building full scripts
- Engaging in more ethical analysis of potential (mis)use cases
- Lots more!

FURTHER READING / SOURCES

- OpenAI's [GPT-2](#)
- Mark Woolf's [gpt-2-simple](#) setup
- Datasets: [EmotionLines](#) and [DailyDialogue](#)
- YouTuber [Tom Scott](#) uses GPT-3 to generate video ideas
- Readings on ethical considerations:
 - [On the Dangers of Stochastic Parrots: Can Language Models Be Too Big?](#)
 - [Training a single AI model can emit as much carbon as five cars in their lifetimes](#)



BONUS SLIDES

VALIDATION: Training Data & Joyful Model

- At *temperature* = 0.9, in a batch of $n = 20$ generations of the joyful model:
 - about 64% of generated utterances are not identical to utterances in the training data
 - about 95% of generated utterances are not identical to other utterances in the batch

	A	B	C	D	E	F	G
1	Fintuned Model	steps (fintuning)	nsamples	temperature	prefix	SELF - % unique	TRAIN - % unique
2	Combined_CR_happiness					85.70% (BASELINE)	
3	Combined_CR_fear					86.89% (BASELINE)	
4	Combined_CR_sadness					91.27% (BASELINE)	
5	Combined_CR_anger					89.02% (BASELINE)	
6	Combined_CR_disgust					94.12% (BASELINE)	
7	Combined_CR_surprise					87.18% (BASELINE)	
8						89.03%	
9	Combined_CR_happiness: test_run_2...	500	20	0.9	New Zealand	100.00%	67.86%
10	Combined_CR_happiness: test_run_3...	500	20	0.9	New Zealand	96.30%	70.37%
11	Combined_CR_happiness: test_run_4...	500	20	0.9	New Zealand	92.00%	64.00%
12	Combined_CR_happiness: test_run_5...	500	20	0.9	First day	93.33%	66.67%
13	Combined_CR_happiness: test_run_6...	500	20	0.9	First day	100.00%	53.33%
14						96.33%	64.45%

SAMPLE TRAINING DATA

```
Combined_CR_sadness.txt
--
C: First we will take some x-rays and see what we're dealing with. I also noticed a small cavity up
front here, so you are going to need a filling.
R: I guess that's what I get for not flossing or brushing my teeth three times a day.
--
C: Yes, what can I do for you?
R: I had a skydiving accident over the weekend and won't be able to come to school today.
--
C: Yes, how can I help you?
R: I ran my car into a tree yesterday and need to miss a few days of school.
--
C: So, how are you feeling today?
R: I'm pretty tired. I haven't been sleeping well.
--
C: What time do you usually go to bed?
R: I don't have one time in particular. I just go to sleep whenever I feel tired.
--
C: Have you been under a lot of stress lately?
R: I just lost my job, and I am unsure about being able to find another one.
--
C: Has anything in your day-to-day life been bothering you lately?
R: I am worried about how I am going to pay my tuition.
--
C: Have you had any unusually stressful situations in your life lately?
R: My mother just passed away last Tuesday.
--
C: What are you doing?
R: Look at me. I look so old! I look as if I were thirty.
--
C: Wow, Arthur! You're as blind as a bat!
R: Yeah, I know, my vision is really blurry at times.
--
```

```
Combined_CR_surprise.txt
--
C: Yes, that's for the units. Installation would probably be another 700 to 1000 dollars. But it depends on
the time spent, of course.
R: You mean installation isn't included? I'm very surprised.
--
C: Not today.
R: What do you mean?
--
C: I went into the bank with my money, and I looked at the exchange board. At first I couldn't believe it. I
thought I was reading the board wrong or something.
R: Why?
--
C: Why?
R: Because the board said 60 pesos for every Taiwan dollar.
--
C: I thought it was wrong too. It didn't make sense.
R: Just two days ago it was 35. How can it be 60?
--
C: So, I went up to the teller and started to exchange the money. And it's true. They really gave me sixty
pesos for the dollar.
R: That's amazing! Really? How could it change so much in two days?
--
C: That's easy. It was your office ergonomics that decided me.
R: You're kidding! Something as simple as that?
--
C: I hate to be the bearer of bad news, but it's that time of year again. Have you got your performance
evaluations finished yet?
R: Oh no! Evaluations! You can tell that's not my favorite job ; I haven't even started yet. When is the
deadline for turning in the completed forms?
--
C: Yes, furthering my education is already bringing about positive results in my workplace as it has
boosted my confidence. As well the tutoring system my school employs offers courses uniquely suite
R: Really? That's great that you found a school that puts your need first.
--
```

Given a call as input (“C: ... ”), we want each fine tuned model to generate a response (“R: ... ”) that is characteristically joyful, sad, fearful, angry, disgusted, or surprised.

EXAMPLE GENERATIONS TO: "C: So, I'm visiting my aunt in New Zealand next week. R: "

JOY

Oh, good. You're going to see a lot of people from your country, who are very interested in travelling to the world's oceans.

R: You're so lucky.
R: It sounds like fun.
R: Oh, that's wonderful!
R: It's delightful to be in the country.
R: Oh, that's wonderful. I really hope you can make it to visit her in time.
R: That's great. I'm very interested to know what she's up to.
R: That's great. Would you like to meet him?
R: Oh, what's that like?
R: Oh, congratulations, congratulations!
R: Don't worry. I'm free next Monday.
R: It's a beautiful time to be a New Zealander! I hope you're bringing along a good trip souvenir.
R: Oh, I see. Well, if you'll excuse me, I should be back by then.
R: It sounds like a good trip!
R: How's your trip going?
R: You are so lucky! I hope to see you again.
R: That's terrific!
R: Yes, it's excellent!
R: Oh, that's great. I just searched on the internet.
R: What a coincidence!
R: That's perfect. You'd have to come with me.
R: Wow, what a beautiful trip!
R: We should come to a game, too.
R: Oh, I see.

SADNESS

So sorry, I'm out of sorts at the moment.

R: It's rainy weather today and I feel a little bit let down by the scenery.
R: Hey, chill out, I'm just trying to help.
R: So sorry, I must have been watching the news.
R: It's rainy weather today and I have to go to the store to change my rain blouse.
R: And I find it's the kindest thing to do.
R: And I'm 18 months old.
R: It's just too hard-hitting and depressing.
R: and I have to tell you that I looove it.
R: So, I'm gonna miss you too.
R: Hey, I'm sorry, I haven't seen you for a long time.
R: So sorry, I gotta go break up with Bonnie now.
R: I am sorry, I'm too tired now. I go to sleep when I see the red light.
R: I'm sorry, I'm going to meet some friends there.
R: And I am worried about my visa.
R: So sorry, I must have been looking for you.
R: Hey, I'm sorry, I-I didn't know. Hey, come on.
R: And I feel a little sad because like, thirty yuan or something.
R: And I'm 18 right now and I have to leave it so I can't return it to you.
R: I'm sorry, I'll be here until 10 again tonight.
R: Hey, if you can wait until tomorrow night, I'll go with you.
R: I am sorry, I just. Look, I-I'm gonna be back to my room in as little as a second.
R: I'm sorry, I was really looking forward to this.
R: And I wonder if I could borrow the car from here instead of going to the airport.

ANGER

Are you crazy? You're losing out on a great opportunity here...

R: Come on! Why are you so bitter?
R: Wait a moment, mom.
R: Waiter! I can't believe it! I can't believe it! I've been so busy
R: Wait a moment, her name is Nellie? Don't you know her?
R: Are you crazy? You android?
R: Come on! Why are you so bitter?
R: Egg! I'm not allowed here.
R: Wait, who's coming to visit you, then?
R: Where? bawl!
R: Come on! Why are you so bitter?
R: what?!R: Come on! Why are you so bitter?
R: Come on! Why are you so bitter?
R: Egg! I told you.
R: Waiter! I don't understand!
R: Egg! I'm totally nuts! I must be attacked by rabid cats!
R: Come on! Why are you so rude to your wife?
R: Waiter! I don't understand!
R: Nooo! Nooooo! Noogie! Stop it! It's expired!
R: You have to be kidding me! Go away! Stop having so many funny pictures!
R: Ross, I'm sorry, but I'm not going to be in touch with that horrible old lady in the tree.
R: Hey, honey! Don't squeeze it so hard!
R: Noo!! I don't care! I'm not, the wires have come loose in your head!
R: Hey, that's not a good look on your part!
R: Nooo! Nooooo! Noogie! Sing!

EXAMPLE GENERATIONS TO: "So, I'm visiting my aunt in New Zealand next week."

SURPRISE

Oh my God! So you're gonna stay here with me?

R: Oh, really?
R: Oh. I have your aunt's itinerary.
R: Oh, my. Is Taiwan!
R: Oh my God! How the hell do you do that?
R: Oh really?
R: What?! Look how crazy it is to live in a world of this size.
R: Oh, my God! What a great way to start a new year!
How did you know we were going to Huntington Beach?
R: Oh really?
R: Oh, really?
R: Oh my God! I have an uncle in Thailand.
R: You told me in advance you were going to visit.
R: Oh, really?
R: Oh, really?
R: Oh really? Are you in Taiwan?
R: Oh my God! What's she doing here?
R: Oh, my.
R: Oh really?
R: Oh, my God! What a horrible guy.
R: Oh no! What do you get out of this?
R: Oh, really?
R: Oh, really? I hope you are going with her.
R: Oh really?
R: You told me in advance you were going to visit, that you were going to visit all over the world.
R: Oh really?
R: Oh, really?
R: Oh, my.

FEAR

She's such a pain in the neck!

R: She is really pretty, isn't she? Her skin looks so baby-smooth!
R: Is it really your turn this week?
R: You are not very funny!
R: It's a pleasure to meet you.
R: She's almost medium.
R: It's no use complaining. If we had got enough money, we wouldn't put up with it!
R: You are driving me up the wall.
R: Is this a restaurant that you want to come back to?
R: What a terrible thing to do!
R: Her husband is a fat cat!
R: Just like yesterday. She's making me sick.
R: She lives just off the coast!
R: She's really pretty, isn't she? Her skin looks so baby-smooth!
R: She said she was too excited to go to sleep.
R: She's really pretty, isn't she? Her skin looks so baby-smooth!
R: She's very sick. I'm just coming from the hospital.
R: She's gone missing.
R: She's very sick. I'm just coming from the hospital.
R: It's a pleasure to meet you. Happy to help you out!
R: She's such a pain in the neck!
R: It's a terrible thing to do in my native tongue.
R: Sorry to trouble you. But I don't think it's right.
R: She's very sick. I'm just coming from the hospital.
R: She's here with a bunch of pot bellies who all smell bad. Sorry to trouble you. But I don't think this fish is fresh. It actually tastes a bit off.

DISGUST

Oh, how awful!

R: She's really nice, isn't she? Her smile is killer!
R: Is it really your turn to be frank?
R: She's gone to get drunk.
R: She said she was too excited to go to sleep.
R: She's here with her husband. And they've got out of control.
R: You are not very funny. I doubt you will become friendly with me again long.
R: She's very sick. I'm sure she'll be soon die.
R: Can you imagine what would be like if we had got into this game?
R: She's such a pain in the neck!
R: She's here with three weeks leave.
R: She's really pretty, isn't she? Her skin looks so baby-smooth!
R: She's a terrible gossip.
R: She's really pretty, isn't she? Her skin looks so baby-smooth!
R: She's going to be seeing her.
R: It's a pleasure to meet you. Love!
R: What a terrible thing to do!
R: You are not very funny. I can't believe I married a woman like you.
R: It's a pleasure to meet you.
R: It's a very bad idea.
R: She's too excited to take a nap.
R: She is very pleased with me.
R: It's no use complaining. If we met face to face, he would certainly get along with me.